BATTERY PACK COMPRISING HEAT-DIFFUSING MEANS

Prior Art

The present invention relates to a battery pack comprising heat-diffusing means from a plurality of battery cells located in a housing.

Rechargeable battery packs are used for operating power tools, for instance. Both during the operation of a battery pack, or in other words during its discharging process, and in the charging process, the currents flowing through the battery cells cause severe heating up of the battery cells. So that in the charging process the temperature of the battery cells will not exceed a maximum allowable threshold - which would lead to destruction of the battery cells - the charging current must be reduced, with the consequence that the charging time for the battery pack is lengthened. If a higher charging current and accordingly a shorter charging time for the battery pack are to be attained, excessive heating of the battery pack must be avoided. In the prior art, measures are therefore taken to diffuse heat of the battery cells from the battery pack. For instance, in European Patent Disclosure EP 940 864 B1, a ventilation system for the battery pack is provided for this purpose; it allows air to flow through the interior of the housing of the battery pack. To that end, air inlet and air outlet openings are provided in the battery pack housing. A disadvantage is that with the flow of air through the housing of the battery pack, dirt particles can also get into the interior of the battery pack. Soiling in the interior of the battery pack, however, can change heat transfers among battery cells and can also impair the electrical function of the battery pack. The parts located in the interior of the battery pack form a high air resistance, which impairs the effectiveness of the heat diffusion.

The object of the invention is to disclose a battery pack with heat-diffusing

means, which have the greatest possible heat-diffusing action and moreover do not impair the function of the battery pack.

Advantages of the Invention

This object is attained with the characteristics of claim 1, in that the wall of the housing surrounding the battery cells is shaped such that it forms at least one duct, which is closed off from the interior of the housing, for a heat-diffusing medium. According to the invention, the heat- diffusing medium is not carried through the interior of the battery pack housing. This prevents dirt from getting into the interior of the battery pack and being able to impair its electrical function. Moreover, the ducts, which are partitioned off from the interior of the battery pack, form only a very slight flow resistance to the heat-diffusing medium flooding through, and the result is a strong cooling action.

Advantageous refinements of the invention are defined by the dependent claims.

The heat diffusion can be optimized in that the at least one duct is shaped such that its wall rests in form- locking fashion against the battery cells adjacent to it. An especially high heat diffusion becomes possible because the wall regions that form the at least one duct at least partly comprise a heat-conducting material.

It is expedient for the wall regions of the at least one duct that comprise a heat-conducting material to be recessed so far from the outer wall regions of the housing that contact with the heat-conducting material by a user is prevented.

Drawing

The invention is described in further detail in terms of a plurality of exemplary

embodiments shown in the drawing. Shown are:

Fig. 1, a plan view on a battery pack with battery cells located in it;

Fig. 2, a cross section A-A through the battery pack, in which the duct for the heat-diffusing medium is a separate part inserted into the housing; and

Fig. 3, a cross section through a battery pack in which the duct is formed by two housing parts.

Description of Exemplary Embodiments

Fig. 1 shows a plan view on a battery pack, in which a plurality of cylindrical battery cells 2 are located in a housing 1. In a position of the battery pack shown, the longitudinal axes of the cylindrical battery cells 2 extend perpendicular to the plane of the drawing.

In the exemplary embodiment shown in Fig. 1, the housing 1 is provided with two ducts 3 and 4, through which a heat-diffusing medium, such as air, can be passed. It is also possible for only one duct or for more than two ducts to be provided. The ducts 3 and 4 are formed by suitable shaping of the housing 1 of the battery pack such that they are completely closed off from the interior of the housing 1. Thus a heat-diffusing medium passed through the ducts 3 and 4 cannot get into the interior of the battery pack, and consequently no dirt particles can get into the housing along with the heat-diffusing medium. The smooth wall of the ducts 3 and 4 assures a fluidically favorable guidance of the heat- diffusing medium, which leads to a very good cooling action. The transporting of the heat-diffusing medium can be done by natural convection, or by means of convection reinforced with a blower. Such a blower may for instance be a component of the battery pack or of the charger for the battery pack, or of the machine into which the

battery pack is inserted.

As the cross section A-A through the battery pack in Fig. 2 also shows, the ducts 3, 4 extend parallel to the longitudinal axes of the cylindrical battery cells 2. This location of the ducts 3 and 4 is especially favorable because the ducts 3 and 4 are located in the nips between the individual battery cells 2. This has the advantage that the walls 5 and 6 of the ducts 3 and 4 can be brought into heat-conducting contact with the adjacent battery cells 2 over a large area. However, the ducts may also be located transversely or diagonally to the battery cells and may also have cured courses. As can be seen particularly from Fig. 1, the walls 5 and 6 of the ducts 3 and 4 are preferably shaped such that they rest by form-locking on the battery cells 2 adjacent to them. If the walls 5 and 6 of the ducts 3 and 4 comprise an especially highly heat-conducting material (such as metal), the heat diffusion action is especially pronounced.

In the exemplary embodiment shown in Fig. 2, the housing 1 of the battery pack comprises an upper housing shell 11 and a lower housing shell 12. The walls 5 and 6 of the ducts 3 and 4, respectively, are formed by respective parts 5, 6 inserted between the two housing shells 11 and 12. As the exemplary embodiment in Fig. 2 shows, these housing parts 5, 6 are recessed relative to the upper housing shell 11 and lower housing shell 12, so that contact by a user with the especially highly heat-conducting material of the walls 5 and 6 is prevented.

In a further exemplary embodiment, shown in Fig. 3, the walls of the ducts 3, 4 are formed directly onto the housing shells 11, 12.